

**Paul J. Nahin.** *Oliver Heaviside, Sage in Solitude: The Life, Work, and Times of an Electrical Genius of the Victorian Age.* xxiii + 320 pp., illus., index. New York: Institute of Electrical and Electronics Engineers, 1988.

This is a book by an engineer—a good book by a careful, historically minded engineer. Paul J. Nahin, a man with the technical background necessary to approach Heaviside's science, had also the patience to slog through Heaviside's handwriting

and presentations. The result of his effort is a lively, informative narrative of Heaviside's life and work, a far cry from the kind of hagiographic treatment Nikola Tesla recently received. Nahin has exhaustively surveyed archives and contemporary sources and is very much at home in historical discussions of Victorian physics. The book is certainly not wholly accessible to the reader unfamiliar with the physics of electromagnetism, but then Heaviside's legacy can be readily summed up for that reader: he put Maxwell's equations into the form everyone knows today, pointed the way to practical long-distance telephony, and postulated the existence of the ionosphere (now known as the Heaviside layer only to jellie cats). Nontechnical readers may want to skip occasional sections, but Nahin saves most of the heavy going for technical notes written in a tutorial style at the end of each chapter. If the reader doesn't know *div*, *grad*, and *curl* before picking up this book, elementary instruction will not be found in those technical notes; on the other hand, there is enough to jog a memory, and such subjects as Heaviside's operational calculus are clearly explained for someone with a background in college mathematics.

Science and technology fused irrevocably in the nineteenth-century electrical advances that shaped Heaviside's work. Without explicitly carrying the baggage of the chicken-egg debate that characterizes much discussion of the interactions of science and technology, Nahin illuminates many of those interactions in Heaviside's work, beginning with the cable telegraphy problems that initiated his career. He is generally careful not to confuse the description of an idea with a working artifact—for example, he points out that Heaviside's mathematical discussion of discrete loading for telephone wires was incomplete without the engineering calculations of George Campbell. However, Nahin gives Heaviside far too much credit for the quadruplex telegraph, something Heaviside merely declared possible; Edison said that reducing the quadruplex to practice was the hardest thing he ever did.

Nahin obviously likes his subject, but he maintains a balanced perspective. Heaviside's nemesis, if he had one more troublesome than his own contentiousness, was William Preece, and he too is treated thoughtfully by Nahin. Preece's under-



Oliver Heaviside's opponent William Preece, here seen trampling Oliver Lodge.

standing of electrical physics was utterly incompetent compared with Heaviside's, yet Preece rose to become chief engineer of the British telegraph service, a position from which he frustrated Heaviside time and again. Nahin points out that Preece was not simply a well-socialized relic from the days of the "practical man"—although he was indeed that—but that he was also ahead of his time, the very model of the twentieth-century managerial bureaucrat, an attribute that served him well in the hierarchical structure of the post office.

As Heaviside's work tails off in the twentieth century, so does the narrative, although Nahin does follow Heaviside's reputation up to the present. If *Sage in Solitude* has a significant fault, it is that Nahin's style can veer from conversational to intrusively emphatic. The text, notes, and even the figure legends are full of exclamation points and emphasized passages, and the author's explanatory enthusiasm sometimes gets the better of him, as when he tells the reader (p. 25) that using *knot* to mean "nautical mile" was nonstandard in 1871 (it was not), or his aside concerning the virtues of copper telegraph wire compared with iron (hard-drawn copper was not widely available until the 1880s). This

minor quibble aside, Nahin has written an enjoyable, useful reference.

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